

# **FIREFIGHTER II MOD C**

## **Hazardous Materials Awareness**

## **Firefighter II, Mod C**

### **Hazardous Materials Awareness**

#### **2-29 Hazardous Materials Awareness**

Meet the requirements defined in NFPA472, Standard for Professional Competence of Responders to Hazardous Materials Incidents, Section 2-2, First Responder Awareness.

- 29-1** Identify the definition of hazardous material.
- 29-2** Describe “standard care”
- 29-3** State or organizations that receive notification of hazardous materials inventories.
- 29-4** Describe Titles I and III of the Superfund Amendments and Reauthorization Act.
- 29-5** Identify the initial notification procedures for hazardous materials incidents in the local emergency response plan or the organization’s standard operating procedures.
- 29-6** Describe the functions of the State Emergency Response Commission and the Local Emergency Planning Committee.
- 29-7** Identify the five levels of responders to hazardous materials emergencies.
- 29-8** Identify the Incident Command System.
- 29-9** Identify the role of the first responder at the awareness level during a hazardous materials incident and given the local emergency response plan or the organization’s standard operating procedures.
- 29-10** Describe other rights and responsibilities afforded the worker in addition to SARA Title III.
- 29-11** Describe the life cycle of hazardous materials.
- 29-12** Identify terms used in reference to hazardous materials.
- 29-13** Identify the general routes of entry for human exposure to hazardous materials.
- 29-14** Describe the differences between
  - 29-14.1** Exposure and contamination
  - 29-14.2** Acute and chronic
  - 29-14.3** Internal and external exposure
- 29-15** Identify the ways hazardous materials are harmful (at incidents) to:
  - 29-15.1** People
  - 29-15.2** Environment
  - 29-15.3** Property
- 29-16** Identify three methods to limit exposure.
- 29-17** Identify the signs and symptoms of exposure to hazardous materials.
- 29-18** Identify the health hazards associated with hazardous materials.
- 29-19** Identify typical occupancies and locations where hazardous materials are manufactured, transported, stored, used and disposed of.
- 29-20** Identify the definitions of hazardous materials, the DOT hazard classes, common examples of materials in each hazard class and the primary hazards associated with each by hazard class.
- 29-21** Identify typical container shapes that may indicate hazardous materials.
- 29-22** Identify markings or colors of containers that may indicate hazardous materials are present.
- 29-23** Identify U.S. placards and labels that indicate hazardous materials.

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- 29-24** Identify facility and transportation markings and colors that indicate hazardous materials, including:
  - 29-24.1** UN/NA identification numbers
  - 29-24.2** NFPA 704 markings
  - 29-24.3** Military hazardous materials markings
  - 29-24.4** Special hazard communications markings
  - 29-24.5** Pipeline markers
  - 29-24.6** Container markings
- 29-25** Identify the basic information on Material Safety Data Sheets (MSDS) and shipping papers that indicate hazardous materials:
  - 29-25.1** Identify where to find MSDS
  - 29-25.2** Identify entries on a MSDS that indicate the presence of hazardous materials.
  - 29-25.3** Identify the entries on shipping papers that indicate the presence of hazardous materials.
  - 29-25.4** Match the name of the shipping papers found in transportation (air, highway, rail, and water) with the mode of transportation.
  - 29-25.5** Identify the person responsible for having the shipping papers in each mode of transportation.
  - 29-25.6** Identify where the shipping papers are found in each mode of transportation.
  - 29-25.7** Identify where the papers may be found in an emergency in each mode of transportation.
- 29-26** Identify examples of clues (other than occupancy, container shape, markings, placards, MSDS and shipping papers) that use the senses of sight, sound, and odor to indicate hazardous materials.
- 29-27** Identify the limitations of using the senses in determining the presence or absence of hazardous materials.
- 29-28** Identify difficulties encountered in determining the specific names of hazardous materials in both facilities and transportation.
- 29-29** Identify sources for obtaining the names of UN/NA identification numbers for, or type of placard associated with, hazardous materials in:
  - 29-29.1** Transportation.
  - 29-29.2** A facility

**Given a copy of the current edition of the North American Emergency Response Guidebook**

- 29-30** Identify the three methods for determining the appropriate guide page for a specific hazardous material.
- 29-31** Identify the two general types of hazards found on each guide page.

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- 29-32** Describe the difference between the isolation distances in the orange-bordered guide pages and the protective action distances in the green-bordered pages.
- 29-33** Identify the definitions for each of the following protective actions:
  - 29-33.1** Isolate hazard area and deny entry
  - 29-33.2** Evacuate
  - 29-33.3** In-place protections
- 29-34** Identify the shapes or recommended initial isolation and protective action zones.
- 29-35** Identify the difference between small and large spills as found in the Table of Isolation Distances.
- 29-36** Identify the circumstances under which the following distances are used at hazardous materials incidents.
  - 29-36.1** Table of initial isolation and protective action distances.
  - 29-36.2** Isolation distances in the numbered guides.
- 29-37** Identify the recommended personal protective equipment for a named hazardous material.
- 29-38** Identify the five-step process developed to safely address an incident involving hazardous materials.
- 29-39** Identify the basic precautions to be taken to protect a firefighter and others in a hazardous materials incident given the local emergency response plan or the standard operating procedures of the authority having jurisdiction.

#### References:

NFPA, Standard for Professional Competence of Responders to Hazardous Materials Incidents, Section 2-2  
Jones & Bartlett, Fundamentals of Fire Fighting Skills, 1<sup>st</sup> ed., Chapters 4, 27, 28, 29, 31, & 32

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**29 Hazardous Materials Awareness**

- I. Identify the definition of hazardous materials. **29.1**
  - A. Hazardous Substances: Any materials that can produce an adverse effect on the health or safety of the person exposed.
  - B. Hazardous Waste: Any waste material, which is ignitable, corrosive, reactive, or toxic, and "which may pose a substantial or potential hazard to human health and safety and to the environment when improperly managed."
  - C. Extremely Hazardous Substances: Products that have an extremely high degree of toxicity. 300+ as determined by the EPA.
- II. Describe "standard of care" **29.2**
  - A. Definition: Is the level of competency anticipated or mandated in the performance of a service or duty.
  - B. Components:
    - 1. Accepted practices
    - 2. Moral, ethical and political issues
    - 3. Court's interpretations and opinions
  - C. Legal implications
    - 1. Negligence: Failure to perform one's duty or responsibility with reasonable regard for foreseeable harm to another.
    - 2. Gross Negligence: Willful or wanton failure to perform one's duty or responsibility
- III. Identify the organizations that receive notification of hazardous materials inventories. **29.3**
  - A. SERC
  - B. LEPC
  - C. Local Fire Department
- IV. Describe Titles I and III of the Superfund Amendments and Reauthorization Act (SARA). **29.4**
  - A. Title I: Requires the Administrator of USEPA (which administers non-OSHA states such as Illinois) to adopt identical standards.

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- B. Title III: Known as Right to Know Act of 1986.
  - 1. 300+ extremely hazardous substances" subject to routine and detailed reporting to designated Federal, State and local government agencies.
  - 2. Also required local planning committee to use this information to create effective plans for hazardous materials emergencies.
  - 3. Four (4) major sections
    - a. Emergency Planning: Requires the Governor of each state to designate a State Emergency Response Commission (SERC)
    - b. Emergency Notification: Requires an industry to notify SERC, LEPC (Local Emergency Planning Committee) and the local fire department if there is a release of a listed hazardous substance that exceeds a certain quantity as specified in the law.
    - c. Community Right to Know Reporting Requirements: Grants citizens the right to obtain information on hazardous materials in their community.
    - d. Toxic Chemical Release and Emissions inventory Reporting: Requires hazardous materials facilities to inform the public about routine day-to-day releases of chemicals.
- V. Identify the initial notification procedures for hazardous materials incidents in the local emergency response plan or the organization's standard operating procedures. **29.5**
- VI. Describe the functions of the State Emergency Response Commission and the Local Emergency Planning Committee. **29.6**
  - A. State Emergency Response Commission
    - 1. Designate emergency planning districts within the state
    - 2. Appoint local emergency planning committees
    - 3. Supervise and coordinate local emergency planning committee activities
    - 4. Establish procedures for receiving and processing information requests regarding hazardous chemicals that may be stored and used at fixed facilities
    - 5. Designate an official to serve as coordinator for information
    - 6. Carry out other responsibilities as designated by the Act and any amendments

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- B. Local Emergency Planning Committee
  - 1. Develop emergency response plans for the jurisdiction they serve
  - 2. Process requests from the public regarding hazardous materials
- VII. Identify the five (5) levels of responders to hazardous materials emergencies
  - A. First Responder Awareness
  - B. First Responder Operations
  - C. Hazardous Materials Technician
  - D. Hazardous Materials Specialist
  - E. On-Scene Incident Commander
- VIII. Identify the Incident Command System. **29-8**
  - A. Recognized as a system that is documented to have been successfully used in managing available resources at emergency operations.
  - B. Consists of procedures:
    - 1. Controlling personnel
    - 2. Controlling Facilities
    - 3. Controlling equipment
    - 4. Controlling communications
  - C. Incident Commander:
    - 1. Responsible for coordinating and controlling all operations
    - 2. Must have all certifications to qualify for Incident Commander
    - 3. Designated to manage the incident from beginning to end
- IX. Identify the role of the first responder at the awareness level during a hazardous materials incident and given the local emergency response plan or the organization's standard operating guidelines. **29-9**
  - A. Allows the first responder to recognize and identify a hazardous materials emergency
  - B. Allows the first responder to initiate an emergency response by notifying appropriate authorities
  - C. Enables the first responder to standby at a safe location until the arrival of emergency responders
  - D. Enables the first responder to deny entry into area.
- X. Describe other rights and responsibilities afforded the worker in addition to SARA Title III. **29-10**

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- A. Medical Surveillance
- B. OSHA requirements
- C. Worker Responsibilities
  - 1. Workers cannot be cited or fined by IDOL, but employers can take disciplinary action for violation or established safety rules.
  - 2. Workers are normally required to follow reasonable workplace safety rules established by the employer and all IDOL regulations.
  - 3. Workers are responsible for wearing required safety equipment.
  - 4. Workers shall seek medical treatment promptly when required. Depending on applicable state law, workers have a right to be treated by a physician of their own choice for work-related injuries. The key here is not to delay medical treatment when necessary.
  - 5. Workers should bring safety and health hazards or concerns to the attention of their supervisor or foreman as soon as possible.
- D. Employer Responsibilities
  - 1. To furnish a safe and healthy job and work environment.
  - 2. To comply with OSHA.IDOL Standards
  - 3. To maintain records of injuries and exposures
  - 4. To maintain baseline and subsequent medical physical records as prescribed by law.
- E. Consensus Standards
  - 1. Means that the standards were developed and approved based on the recommendations of representatives of a specific industry, trade, profession, etc.
- F. NFPA471
  - 1. Provides detailed methods and operational procedures for responding to Hazmat Incidents.
- G. NFPA472
  - 1. Establishes specific knowledge and competence levels that response personnel need for hazardous materials incidents.
- H. NFPA473
  - 1. Addresses specific competencies needed by Emergency Medical Services personnel



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XI. Describe the life cycle of hazardous materials. **29-11**

- A. Manufactured
- B. Stored by manufacturer
- C. Transported to producer
- D. Used to produce a product
- E. Stored by producer
- F. Transported to a user or distributor
- G. Stored by user or distributor
- H. Used by user
- I. Transported to a waste treatment facility
- J. Treated, stored or disposed

XII. Identify terms used in reference to hazardous materials **29-12**

- A. Toxicity
  - 1. TLV (Threshold Limit Values) - TWA: Time Weighted Average
    - a. Threshold limit value established for workers based on a safe chemical exposure for eight hours a day for forty hours per week. Unit of measure is Parts Per Million (PPM)
  - 2. PEL: Permissible Exposure Limits
    - a. Used by OSHA in its health standards covering exposure. Similar to TLV-TWA
  - 3. TLV-STEL (Short Term Exposure Limits)
    - a. Threshold value established for a safe (without permanent toxic effects) short-term exposure (15 minutes) for emergency workers. This is more appropriate than TLV-TWA for emergency workers.
  - 4. TLV-C (Ceiling):
    - a. Threshold limit value that is set just below the concentration that will cause immediate irritation. This limit may not be exceeded for even an instant.

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5. IDLH (Immediately Dangerous to Life and Health):
  - a. The maximum level to which a healthy worker can be exposed for thirty minutes to a chemical and escape without suffering irreversible health effects or escape impairing symptoms.
6. LD50 (Lethal Dose 50%):
  - a. The concentration of an ingested, absorbed, or injected substance that results in the death of 50% of the population.
7. LC50 (Lethal Concentration 50%)
  - a. The concentration of an inhaled substance that results in the death of 50% of the population in a specified time.

**B. Radiation**

1. Energy that is emitted, transmitted, or absorbed in wave or energetic particle form.
2. Types:
  - a. Alpha:
    - 1) Have a very low penetrating ability
    - 2) Can be stopped by a very thin sheet of paper or outer layer of skin
    - 3) Not an external hazard
    - 4) Ingested or inhaled, become very hazardous
  - b. Beta
    - 1) Low penetrating ability
    - 2) Can be shielded or stopped by thin sheets of metal, plastic, or clothing
    - 3) Can cause burns ranging in severity from minor to extreme
    - 4) Also harmful if inhaled or ingested

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c. Gamma

- 1) Not particles, but waves similar to light waves
- 2) Can be shielded by lead, steel, concrete or water
- 3) Great penetration powers
- 4) Is the most dangerous common form of ionizing radiation
- 5) Causes much cellular damage

d. Neutron

- 1) Radiation is high energy form of ionizing radiation
- 2) Most penetrating, but not very reactive
- 3) Very rarely encountered

C. Etiological Harm

1. Involves exposure to microorganisms or their toxins

D. Psychological Harm

1. Stress of dealing with severe trauma, destruction, death or slow pace of incidents
2. Should include a policy to provide assistance

E. Boiling Point: Temperature at which the vapor pressure of a material is equal to or greater than atmospheric pressure.

F. Flashpoint: Minimum temperature of a liquid at which it will give off sufficient vapor to form an ignitable mixture with air near the surface.

G. Ignition temperature: Minimum temperature at which a material will ignite without a spark or flame being present.

A. Explosive (flammable limits)

1. Lower Explosive Limit (LEL): Minimum vapor or gas concentration in air below which a substance will not burn.
2. Upper Explosive Limit (UEL): Maximum concentration of a substance in air above which ignition will not take place.

B. Flammable Range: Numerical difference between UEL and LEL.

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- C. Vapor Density: Weight of a volume of pure gas or vapor compared with an equal volume of dry air; useful in determining if a vapor will rise or settle.
  - D. Specific Gravity: Weight of a substance compared with an equal volume of water; useful in determining if a material will sink or float in water.
  - E. Water solubility: Degree to which a material will dissolve in water.
  - F. Toxicity: ability of a substance to cause tissue damage; impairment, severe illness, or death when ingested, inhaled, or absorbed by the skin.
  - G. Corrosiveness: Destructive to tissue and/or metal.
  - H. Radioactivity: Materials which emit radiation
  - I. Oxidizing Ability: Materials which contain large amounts of free oxygen
  - J. Instability: Materials capable of undergoing rapid chemical change.
  - K. Reactivity: Materials that undergo rapid change when exposed to air or water.
  - L. Expansion Ratio: Determination of how many volumes of a gas or vapor are produced by the evaporation of one volume of liquid.
- XIII. Identify the general routes of entry for human exposure to hazardous materials. **29-13.**
- A. Absorption
  - B. Inhalation
  - C. Ingestion
  - D. Injection
- XIV. Describe the differences between: **29-14**
- A. Exposure and contamination **29-14.1**
    - 1. Exposure
      - a. Implies being in physical proximity to a hazard.
      - b. No physical contact has been made
      - c. Cannot be spread by exposed person to others
      - d. Severity of any injury depends on the substance involved as well as susceptibility of the individual

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2. Contamination
  - a. Implies direct physical contact with a hazardous substance
  - b. Contaminated individual may be injured by substance
  - c. Contaminated individual may spread risk to others
  - d. Severity of injury depends on substance and the individual

**B. Acute and chronic 29-14.2**

1. Acute
  - a. Develops quickly usually after exposure at high concentrations of a hazardous substance
2. Chronic
  - a. Takes a long time to develop or requires exposure over a long period of time, usually at low concentrations

**C. Internal and external exposures 29-14.3**

1. Internal
  - a. Develops when a substance enters the body and attacks internal organs.
2. External
  - a. Develops when a substance comes in contact with external tissues.

**XV. Identify the ways hazardous materials are harmful (at incidents) to: 29-15**

**A. People 29-15.1**

1. Health
2. Evacuation

**B. Environment 29-15.2**

1. Pollution
2. Wildlife Hazard

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C. Property 29-15.3

1. Contamination (Long Term)
2. Destruction/Non-usage (Long Term)

**XVI. Identify three methods to limit exposure. 29-16**

- A. Time
- B. Distance
- C. Shielding

**XVII. Identify the signs and symptoms of exposure to hazardous materials. 29-17**

- A. Confusion
- B. Light-headedness
- C. Anxiety
- D. Coughing or painful respiration
- E. Tingling or numbness of extremities
- F. Changes in behavior mannerisms
- G. Unconsciousness
- H. Dizziness
- I. Blurred or double vision
- J. Change in skin color or blushing
- K. Loss of coordination
- L. Nausea, vomiting, abdominal cramping and diarrhea

**II. Identify the health hazards associated with hazardous materials. 29-18**

- A. Poisons/Toxins
  1. Chemicals which cause disruption or alteration of the nervous system
  2. May be classified as nerve poisons, anesthetics, narcotics and organ poison
- B. Carcinogens
  1. Substances which may cause cancer

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- C. Corrosives
    - 1. Substances that cause the chemical degradation of tissues or metals.
    - 2. May be classified as acids or bases
      - a. Acids: substances that denature the protein of tissue ahead of nerve cells
      - b. Bases: substances that react with fatty tissue to form soap
  - D. Cryogenics
    - 1. Substances that have been refrigerated to temperatures of -130 degrees F. or below.
    - 2. Cryogenic gases are gases that have been liquefied by the reduction of temperature
- III. Identify typical occupancies and locations where hazardous materials are manufactured, transported, stored, used and disposed of. **29-19**
- A. Fixed facilities
    - 1. Service stations
    - 2. Hardware stores
    - 3. Laboratories and medical facilities
    - 4. Doctor's and Dentist's offices
    - 5. Farms and associated service industries
    - 6. Industrial sites
    - 7. Residences
    - 8. Shops/Stores
    - 9. Construction sites
    - 10. Educational institutions
    - 11. Military institutions
  - B. Transportation
    - 1. Roadway transportation
    - 2. Railway transportation
    - 3. Waterway transportation
    - 4. Air transportation
    - 5. Pipeline transportation

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- IV. Identify the definitions of hazardous materials, the DOT hazard classes, common examples of materials in each hazard class and the primary hazards associated by each hazard class. **29-20**

US Classes and Divisions	US Classes pre-January, 1991	Examples of Materials	General Hazard Properties
<b>Class 1</b> Division 1.1 - Explosives with mass explosion hazard  Division 1.2 Explosives with projection hazard  Division 1.3 - Explosives with fire, minor blast or minor projection hazard  Division 1.4 - Explosive devices with minor explosion hazard  Division 1.5 - Very insensitive explosives  Division 1.6 - Extremely insensitive explosives	Class A Explosives  Class A/B Explosives  Class B Explosives  Class C Explosives  Blasting agents	Dynamite, TNT, Black Powder  Certain rockets, projectiles, igniters, aerial flares and fireworks, rocket motors and smokeless powder  Flexible detonating cord and small arms ammunition  ANFO Ammonium Nitrate and fuel oil, some type B and E blasting agents	Explosive: exposure to heat, shock or contamination could result in thermal and mechanical hazards
<b>Class 2</b> Division 2.1 (Flammable gas)  Division 2.2 (Non-flammable/Non-Poisonous gas) Division 2.3 Poisonous Gas	Flammable gas  Non flammable gas  Poison A	Hydrogen, Acetylene, Propane and Vinyl Chloride Carbon Dioxide, Oxygen and Anhydrous Ammonia  Chlorine	Under pressure: Container may rupture violently (fire and non-fire) may be flammable, poisonous, corrosive, an asphyxiant, and/or an oxidizer
<b>Class 3</b> Flammable liquid	Flammable liquid	Gasoline, Toluene, and Ethyl Alcohol	Flammable: container may rupture violently from heat/fire, may be corrosive, toxic and/or thermally unstable
<b>Combustible</b>	Combustible	Diesel fuel, mineral oil	
<b>Class 4</b> Division 4.1 (Flammable solid) Division 4.2 (Spontaneously combustible materials) Division 4.3 (Dangerous when wet material)	Flammable solid  Flammable solid and liquid  Flammable solid and liquid	Magnesium  White phosphorus  Metallic sodium and calcium carbide	Flammable: Some spontaneously combustible may be water reactive, toxic and/or corrosive; may be extremely difficult to extinguish



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US Classes and Divisions	US Classes pre-January, 1991	Examples of Materials	General Hazard Properties
<b>Class 5</b> Division 5.1 - Oxidizer  Division 5.2 - Organic Peroxide	Oxidizer  Organic Peroxide	Calcium Hypochlorate, Ammonium Nitrate and Hydrogen Peroxide Type B through F Organic Peroxides	Supplies oxygen to support combustion; sensitive to heat, shock, friction and/or contamination
<b>Class 6</b> Division 6.1 - Poisonous Materials Division 6.2 - Infectious substances	Poison B, Irritant, ORM-A  Etiological Agent	Tetraethyl Lead, Hydrogen or Sodium Cyanide and Parathion Virus or biological specimens	Toxic by inhalation, ingestion and skin/eye absorption; may be flammable
<b>Class 7</b> Radioactive Materials	Radioactive Materials	Cobalt, Uranium Hexafluoride	May cause burns and biological effects; energy and matter
<b>Class 8</b> Corrosive Materials	Corrosive materials ORM-B	Acids - Sulfuric, Acetic, Hydrochloric Bases: Sodium Hydroxide, Potassium Hydroxide and Alkali Battery Fluid	Disintegration of contacted tissues; may be fuming, water reactive
<b>Class 9</b> Miscellaneous Hazard Materials	ORM-C ORM-E	Molten sulfur, dry ice and PCB's	
<b>ORM-D</b>	ORM-D	Consumer commodities: laundry bleach, charcoal lighter fluid	

#### V. Identify typical container shapes that may indicate hazardous materials. **20-21**

##### A. Atmospheric Pressure Tank Truck (MC306/DOT406)

- Trailers with an oval cylinder shape generally carry flammable and combustible liquids.
- Identified by aluminum or elliptical tank construction and valving and unloading control under tank.

##### B. Low Pressure Chemical Carrier (MC307/DOT407)

- Tank is designed to carry various chemicals at low pressure.
- Identified by horseshoe shaped or round cylinder, often insulated with a double shell; top manhole assembly protected by a flashing box; drain hose from the flashing box down one side

##### C. Corrosive Liquid Carrier (NC312/DOT412)

- Carries corrosive liquids, strong acids and bases
- Identified by Small circular diameter shape with reinforcing exterior stiffening rings; a rear or middle top loading/unloading station with exterior piping extending to the bottom of the tank

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D. High Pressure Liquefied Gas Tanker (MC331)

1. Carries gases that have liquefied by increasing the pressure and compressing them to liquid state.
2. Identified by rounded heads on both ends, a bolted manhole at the rear and guard cage around the bottom loading/unloading piping.

E. Intermodal containers

1. Can be transported by highway, rail or water.
2. Standard size and stackable
3. Can transport any class of hazardous materials

F. Portable containers

1. Used to transport in quantities of 119 gallons or more
2. Intermediate Bulk Containers have a capacity of 119 to 793 gallons; can be made of metal, wood, fiberboard, plastic, textile or paper; marked with UN standard
3. Portable tanks can be made of steel and have skids attached for loading onto transports; pressure ranges from 60 PSIG to 500 PSIG; industry call them "totes"
4. Multi-unit Tank car tanks have a capacity, in water weight, of 1500 to 2600 pounds (180 to 312 gallons); round metal containers and are used to transport compressed gases.

G. Fixed Tanks

1. Cone Roof Tanks: Vertical cylindrical walls supporting a fixed inverted cone roof; operates at atmospheric pressure; may have insulation
2. Internal Cone Floating Roof Tanks: Cone roof tank with internal floating roof; identified by large vents at the roof wall seam
3. Open Floating Roof Tank: Wind girder around the top of the tank shell; ladder on roof; roof floats on materials
4. Horizontal Tanks: Cylindrical tank sitting on supports, Structural integrity of supports critical
5. Sphere Tanks: Single shell non-insulated tank' pressures of 100 to 500 psi; may have water spray system for protection
6. Underground Storage Tank: Any tank with greater than 10% surface area underground; clues: vents; fill pints, occupancy or location

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H. Individual Containers

1. Drums
2. Boxes
3. Glass containers
4. Bags
5. Wooden barrels

I. Cryogenic Containers

1. Heavily insulated containers
2. Safety relief valves and rupture disks vent off excess pressure

J. Radioactive Material Containers

1. Low-level sources may be packaged in fiberboard or cardboard boxes, wooden boxes or steel drums to ensure radiation is not released.

K. Pressurized Cylinders

1. Compressed gas cylinders range in size and have varying pressure
2. All approved cylinders with the exception of Division 2.3 are equipped with safety relief devices

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XXII. Identify markings or colors of containers that may indicate hazardous materials are present. **29-22**

XXIII. Identify US placards and labels that indicate hazardous materials. **29-23**

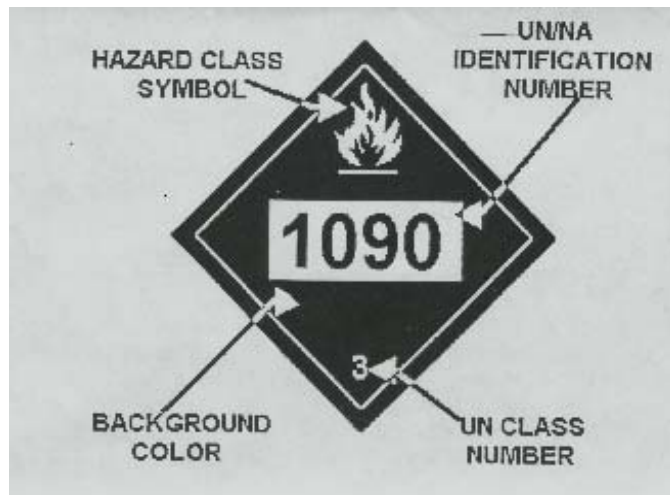
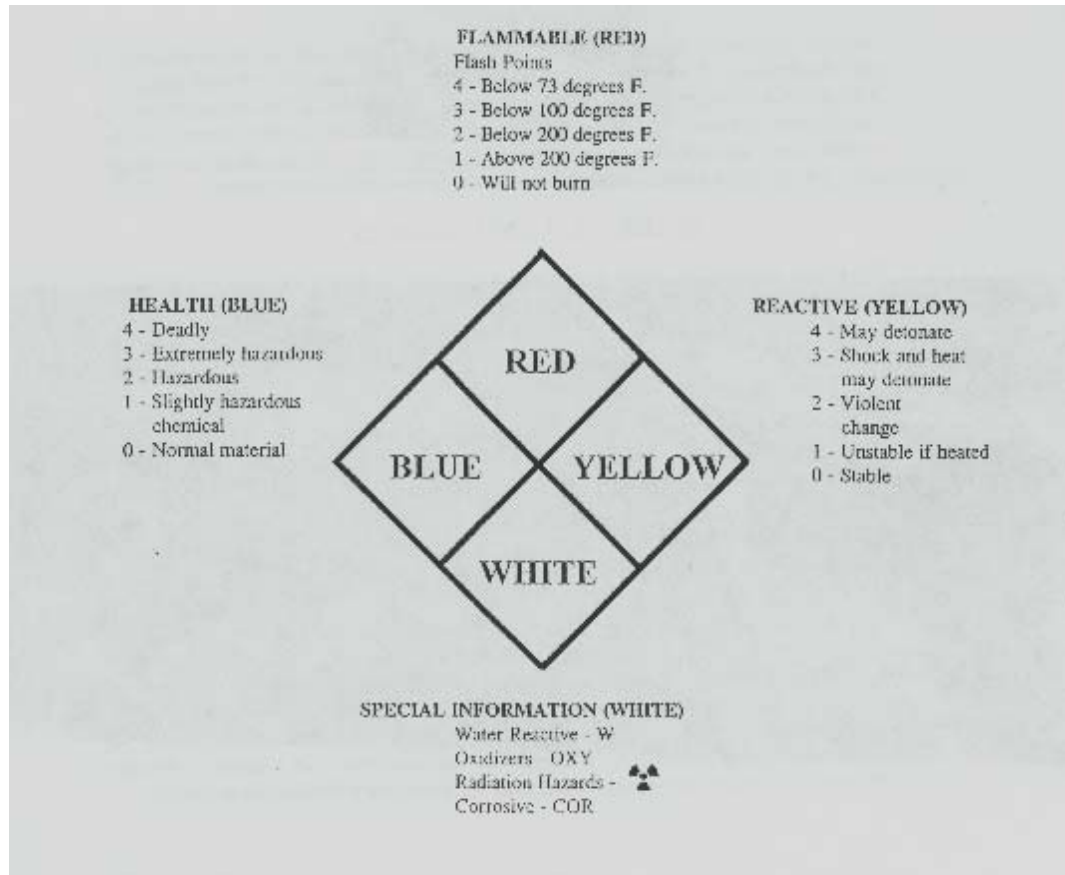
XXIV. Identify facility and transportation markings and colors that indicate hazardous materials including:

A. UN/NA Identification numbers **29-24.1**

<b>E</b>	<b>Explosives</b>	Class A, B, C and Blasting Agents Division 1.1, 1.2, 1.3, 1.4, 1.5, 1.6
<b>G</b>	<b>Compressed Gases</b>	Flammable Gases 2.1 Non Flammable Gases 2.2 Oxidizing Gases 2.2 Poison/toxic Gases 2.3
<b>L.</b>	<b>Flammable Liquids</b>	Flammable Liquids 3 Combustible Liquids 3
<b>S</b>	<b>Flammable Solids</b>	Flammable Solids 4.1 Spontaneously Combustibles 4.2 Dangerous when Wet 4.3
<b>O</b>	<b>Oxidizers</b>	Oxidizers 5.1 Organic Peroxides 5.2
<b>P</b>	<b>Poisons</b>	Poison/toxic Inhalation hazard 6.1 Dangerous keep away from food 6.1 Etiological/regulated medical waste 6.2
<b>R</b>	<b>Radioactive materials</b>	Class 7, White I Class 7, Yellow II Class 7, Yellow III
<b>C</b>	<b>Corrosives</b>	Corrosives 8
<b>O</b>	<b>Other</b>	Miscellaneous Hazardous Materials 9 ORM-D

## Firefighter II, Mod C Hazardous Materials Awareness

### B. NFPA 704 markings **29-24.2**



## Firefighter II, Mod C Hazardous Materials Awareness

### C. Military hazardous materials markings 29-24.3

MASS DETONATION  
EXPLOSION WITH FRAGMENTS  
MASS FIRE HAZARD  
MODERATE FIRE HAZARD



CHEMICAL HAZARD  
SYMBOL



APPLY NO  
WATER



WEAR PROTECTIVE  
MASK OR BREATHING  
APPARATUS

CLASS 1  
CLASS 2  
CLASS 3  
CLASS 4



MASS DETONATION



EXPLOSIVE WITH  
FRAGMENT HAZARD



MASS FIRE HAZARD



MODERATE FIRE  
HAZARD

**Firefighter II, Mod C**  
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- D. Special hazard communication markings **29-24.4**
  - E. Pipeline markers **29-24.5**
    - 1. Required when a pipeline crosses:
      - a. Under a rail line
      - b. Crosses a public road
      - c. Crosses a waterway
      - d. Spaced along the pipeline.
    - 2. Contains the word “Warning”, product information, name of carrier and emergency contact phone number
  - F. Container markings **29-24.6**
    - 1. Contains:
      - a. Level of toxicity
      - b. Signal words
      - c. State of practical treatment
      - d. Physician or chemical hazard statement
      - e. Product name
      - f. Ingredient statement
      - g. Environment information
      - h. EPA registration number
      - i. EPA establishment number
- XXV. Identify the basic information on Material Safety Data Sheets (MSDS) and shipping papers that indicate hazardous materials: **29-25**
- A. Identify where to find MSDS **29-25.1**
    - 1. Highway: Cab of vehicle
    - 2. Rail: A crew member
    - 3. Water: Wheelhouse or pipe-like container on barge
    - 4. Air: Cockpit

**Firefighter II, Mod C**  
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- B.** Identify entries on a MSDS that indicate the presence of hazardous materials. **29-25.2**
1. Material name
  2. Chemical formula
  3. Common synonyms
  4. Chemical family
  5. Manufacturer's name
  6. Emergency number
  7. Hazardous ingredients
  8. Regulated exposure limits
  9. Physical data
  10. Fire and explosion data
  11. Health hazard data
  12. Reactivity data
  13. Spill or leak procedures
  14. Special protection information
  15. Special precautions
- C.** Identify the entries on shipping papers that indicate the presence of hazardous materials. **29-25.3**
1. Packing Group # I, II, & III. The worst is "I", with possible special shipping requirements.
  2. "RQ" on the shipping papers indicates the threshold quantity that is reportable is the product is spilled.
- D.** Match the name of the shipping papers found in transportation (air, highway, rail and water) with the mode of transportation **29-25.4**
1. Highway - Bill of lading
  2. Rail - Waybill/Consist
  3. Water - Dangerous Cargo Manifest
  4. Air - Air bill with shipper's certification for restricted articles
- E.** Identify the person responsible for having the shipping papers in each mode of transportation. **29-25.5**
1. Highway - Driver
  2. Rail - Train crew member
  3. Water - Captain or master
  4. Air - Pilot



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- F. Identify where the shipping papers are found in each mode of transportation **29-25.6**
1. Highway - cab of vehicle
  2. Rail - a crew member
  3. Water - Wheelhouse or pipe like container on barge
  4. Air - cockpit
- XXVI. Identify examples of clues (other than occupancy, container shape, markings, placards, MSDS and shipping papers) that use the senses of sight, sound and odor to indicate hazardous materials. **29-26**
- A. Vision: Detect:
1. Fire
  2. Smoke
  3. Vapor clouds
  4. Corrosive actions
  5. Chemical reactions
  6. Ascertain if victims present
- B. Hearing: Detect
1. Unusual sounds
  2. Witnesses
- XXVII. Identify the limitations of using the senses in determining the presence or absence of hazardous materials. **29-27**
- A. Gather information at a safe distance to avoid risk of exposure or contamination from hazardous materials.
- XXVIII. Identify difficulties encountered in determining the specific names of hazardous materials in both facilities and transportation. **29-28**
- A. Placards missing or not visible
  - B. Lack of access to information (MSDA Sheets)
  - C. Improper containers for product
  - D. Lack of tracking a products location within a facility.

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XXIX. Identify sources for obtaining the names of UN/NA identification numbers for, or type of placard associated with, hazardous materials in: **29-29**

- A. Transportation **29-29.1**
  - 1. North American Emergency Response Guidebook
- B. A facility **29-29.2**
  - 1. NFPA 704

**Given a copy of the current edition of the North American Emergency Response Guidebook:**

XXX. Identify the three methods for determining the appropriate guide page for a specific hazardous materials. **29-30**

- A. Yellow Section: Chemicals are listed in numeric order based on the 4-digit number assigned to the chemical.
- B. Blue Section: Chemicals are listed alphabetically
- C. Orange Section: Guides are arranged by hazard class

XXXI. Identify the two general types of hazards found on each guide page. **29-31**

- A. There is no fire
- B. Fire involved

XXXII. Describe the difference between the isolation distances in the orange-bordered guide pages and the protective action distances in the green-bordered pages. **29-32**

- A. Orange: No evacuation requirements
- B. Green: Evacuation distances required for public safety

XXXIII. Identify the definitions for each of the following protective actions: **29-33**

- A. Isolate hazard area and deny entry **29-33.1**
  - 1. Means keep everybody away from the area if they are not directly involved in emergency response operations.
  - 2. Unprotected emergency responders should not be allowed to enter the isolation zone.

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- B. Evacuate **29-33.2**
  - 1. Means move all people from a threatened area to a safer place.
- C. In-Place protections **29-33.3**
  - 1. Means people should seek shelter inside a building and remain inside until the danger passes.
- XXXIV. Identify the shapes or recommended initial isolation and protective action zones. **29-34**
  - A. Initial Isolation Zone: Circle around incident based on isolation requirements in ERG.
  - B. Protective Active Zone: Square; length and width equals  $\frac{1}{2}$  downwind distance
- XXXV. Identify the difference between small and large spills found in the Table of Isolation Distances. **29-35**
  - A. Small Spill: One that involves a single, small package, small cylinder, and small leak from a large package.
  - B. Large Spill: One that involves a spill from a large package of multiple spills from many small packages.
- XXXVI. Identify the circumstances under which the following distances are used at a hazardous materials incident. **29-36**
  - A. Table of initial isolation and protective action distances. **29-36.1**
    - 1. Used to determine the size of the downwind areas that could be affected by a cloud of toxic gas.
  - B. Isolation distances in the numbered guides. **29-36.2**
    - 1. Isolation areas are done first to establish control over the area of operations.
- XXXVII. Identify the recommended personal protective equipment for a named hazardous material. **29-37**
  - A. SCBA
  - B. Chemical Protective Clothing and Equipment

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XXXVIII. Identify the five-step process developed to safely address an incident involving hazardous materials. **29-38**

- A. Isolate
  - 1. Started when the scene is approached from uphill and upwind, and from a safe distance.
  - 2. Evaluation of scene immediately begins
- B. Identify
  - 1. Determine if hazardous materials are present
- C. Notify
  - 1. Response and mitigation depends on how well the initial information is communicated and the initial identification is accomplished.
- D. Mitigate
  - 1. As awareness level responders, the mitigation strategy of choice should be non-intervention
- E. Terminate
  - 1. Documentation
  - 2. Debriefing

XXXIX. Identify the basic precautions to be taken to protect a firefighter and others in a hazardous materials incident given the local emergency response plan or the standard operating procedures of the authority having jurisdiction. **29-39**

- A. Approach cautiously from upwind
- B. Secure the scene
- C. Identify the hazards
- D. Assess the situation
- E. Obtain help
- F. Decide on site entry
- G. Respond
- H. Do not walk into or touch spilled materials.
- I. Avoid inhalation of fumes, smoke or vapors.